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sonal efforts, many others were helped by his advice and assistance.

Professor Putnam's influence has been great in still other ways. He succeeded in having anthropology recognized by Harvard University as a regular subject of instruction, with the result that an ever-increasing number of students became interested in this subject. His influence as a lecturer was, however, not as great as that of his personal contact with students. Through his sympathy with the personal interests of younger men, through his eagerness to help them along on the arduous path of the young scientist, he associated with himself a large number of young anthropologists who were filled with that enthusiasm for the unbiased collection of data that characterized his own work. The precedent set by Harvard University, and at the same time by Clark University, and Professor Putnam's unceasing agitation have done much to introduce anthropology as a subject of study in our universities. Men who have grown up as his students are now found in many American and Canadian institutions.

Professor Putnam's activities were not by any means confined to the field of his own researches, but he took a lively interest in the advancement of scientific work in the whole country. This quality, his genius as an organizer, and his sympathetic nature brought him into prominence in the work of the American Association for the Advancement of Science, of which he was for many years permanent secretary and which he made a most efficient means of promoting and extending the influence of science. It is a well-marked period of scientific development that his incumbency of the secretaryship represents: the extensive and gradual deepening of scientific interest. It covers the period preparatory to the specialization of more modern times that makes the American Association more an administrative clearing house of special scientific bodies than an agency that promotes popular interest and that gives to the young scientist the opportunity to gain his first laurels.

For several years Professor Putnam had been ailing, but his robust nature withstood

vigorously the attacks of an insidious disease. On the occasion of his seventieth birthday his many friends gave expression to their warm feelings towards him by the publication of an anniversary volume containing contributions from almost all American anthropologists. His influence, that of a sane and sober scientist who values facts higher than fancies will be lasting, and we honor and love one who has helped to lay the foundations on which we are permitted to build.

FRANZ BOAS

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PAUL EHRLICH¹

PAUL EHRLICH was a genius of the first order. While he was still a student of medicine, the problems presented by the affinity of lead for certain tissues attracted his attention. From speculating on the nature of this affinity, his interest grew to include protoplasmic affinities in general, and thus was determined the direction his genius should take.

Some of the notable results of his early investigations are discoveries in bacterial staining methods, which proved of great value to Koch and which, ever since, have been in daily use everywhere; the micro-chemical differentiation of leukocytes, on which rests the study of the blood for clinical purposes; the development of the methylene blue reaction of living tissues, and the formulation of that unique conception of protoplasmic structure and function on which he based the great side-chain theory which he advanced to explain the reactions in immunity and other phenomena.

What might be termed the second phase of Ehrlich's work concerned investigations in immunity under the guidance of the side-chain conception. No better illustration of the practical usefulness of the imagination in creating a successful working hypothesis can be given than the results achieved by Ehrlich in the field of immunity. Perhaps the usefulness is seen most clearly in the standardization of

¹ From the *Journal* of the American Medical Association.

diphtheria antitoxin, which was a direct outcome of experiments devised according to the side-chain idea. Ehrlich's method, to the exclusion of others, is used all over the world; but the influence of the work carried out to test the side-chain theory of Ehrlich and his pupils still dominates investigation in all branches of immunity and the practical use of the knowledge obtained therefrom.

The side-chain theory is so well known that it is not necessary to restate it except in the most succinct form. A toxin or other antigen is without action on the animal body unless bound by molecular chains in the cells—receptors. But when so bound, the antigen causes injury to the cell, and subsequent repair, in the course of which there is an overproduction of receptors, which, passing into the blood and lymph, constitute the antibody for the antigen in question, because the antigen is now bound and neutralized or destroyed before it can reach the cell. As expressed by Behring, antibodies are free cell receptors, and the elements which, when situated in the cells, are essential for the action of toxins, for instance, are also the means of healing when free in the blood. In accord with the principles of this theory, Ehrlich's vivid mind coined numerous new words, which proved helpful in the discussion of new facts and ideas, and which soon passed into current international usage.

Ehrlich's last work was the development of the experimental chemotherapy of syphilis and certain other spirochetal infections. To discuss this wonderful work fully in all its ramifications is not possible at this time. The scientific world has accepted "the development through a lengthy series of systematic biochemical experiments, based on original conceptions of the affinities of cellular constituents, of a successful chemotherapy of important human infections, by direct attack on the parasites by substances specially built up for that purpose and introduced from without," as the fitting culmination of the tireless activities of an altogether unique investigative spirit. As pointed out elsewhere, Ehrlich's results in experimental chemotherapy fully justify Hux-

ley's prediction in 1881 that through discoveries in therapeutics it would become possible "to introduce into the economy a molecular mechanism which, like a cunningly contrived torpedo, shall find its way to some particular group of living elements and cause an explosion among them, leaving the rest untouched."

Paul Ehrlich will live in the history of civilization as one of the great investigators, genial, creative, fertile, excelling in "that boldness of the scientific use of the imagination which alone can extend beyond the obvious fact and reveal the unknown," one of the great benefactors of mankind.

THE NEW YORK BOTANICAL GARDEN

THE New York Botanical Garden at Bronx Park is celebrating this week the twenty-fifth anniversary of its foundation. The first session was opened at nine o'clock Monday morning, September 6, with registration of delegates in the library, followed by an inspection of museums, laboratories, library and herbaria, with special reference to the exhibition of painting of plant life by Mary E. Eaton in the herbarium, and the Charles Finney Cox collection of Darwiniana. After lunch in the Museum Building the delegates and guests were formally welcomed by W. Gilman Thompson, president of the board of managers; by Henry H. Rusby, chairman of the scientific directors, and by Thomas W. Whittle, commissioner of parks for the Bronx. Dr. N. L. Britton, director-in-chief, then read "A History of the New York Botanical Garden."

Tuesday, September 7, was set for the reading of papers. According to the program these included: "Mechanism and Conditions of Growth," by D. T. MacDougal; "Mosses from Florida," by Elizabeth G. Britton; "Directing Factors in the Teaching of Botany," by Arthur H. Chivers; "Flora of the Mammoth Cave, Kentucky," by R. Ellsworth Call; "Triassic Plants from Sonora, Mexico," by Edwin W. Humphreys, and "A White-Cedar Swamp on Long Island and Its Significance," by Norman Taylor; "On the Nature of Types," by